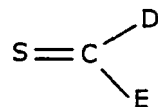
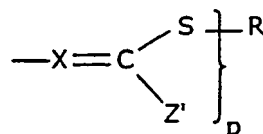


WHAT IS CLAIMED IS:

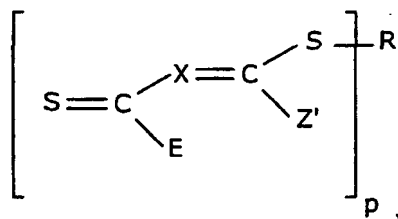
1. A process for producing a polymer, said process comprising polymerizing a monomer mix into said polymer in the presence of a source of free radicals and a chain transfer agent having a transfer constant in the range of from
- 5 0.1 to 5000, said chain transfer agent having the following formula:



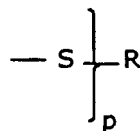
wherein when D is D1 of the following formula:



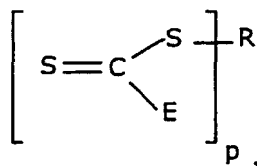
- then p is in the range of from 1 to 200, E is Z' and said transfer agent is of the
- 10 following formula:



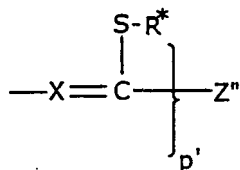
wherein when D is D2 of the following formula:



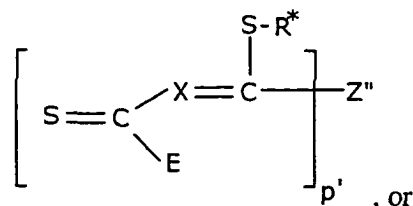
- then p is in the range of from 1 to 200, E is E1 or E2 and said transfer agent is of
- 15 the following formula:



wherein when D is D3 of the following formula:

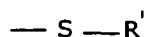


then p' is in the range of from 2 to 200, E is Z, E1 or E2 and said transfer agent is of the following formula:

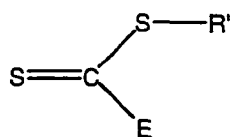


wherein when D is D4 of the following formula:

5



then E is E3 or E4 and said transfer agent is of the following formula:



where in all of the above:

R is a p -valent moiety derived from a moiety selected from the group consisting of substituted or unsubstituted alkane, substituted or unsubstituted alkene, substituted or unsubstituted arene, unsaturated or aromatic carbocyclic ring, unsaturated or saturated heterocyclic ring, an organometallic species, and a polymer chain, R^\bullet being a free radical leaving group resulting from R that initiates free radical polymerization;

15 R^* and R' are monovalent moieties independently selected from the group consisting of a substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, unsaturated or aromatic carbocyclic ring, unsaturated or saturated heterocyclic ring, substituted or unsubstituted alkylthio, substituted or unsubstituted alkoxy, substituted or
20 unsubstituted dialkylamino, an organometallic species, and a polymer chain, R^{\bullet} being a free radical leaving group resulting from R^* that initiates free radical polymerization;

X is selected from the group consisting of a substituted or unsubstituted methine, nitrogen, and a conjugating group;

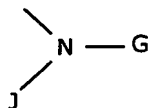
25 Z' is selected from the group consisting of E1, E2, halogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or

unsubstituted alkylthio, substituted or unsubstituted alkoxycarbonyl, substituted or unsubstituted -COOR", carboxy, substituted or unsubstituted -CONR"₂, cyano, -P(=O)(OR")₂, -P(=O)R"₂; wherein R" is selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted aralkyl, substituted or unsubstituted alkaryl, and a combination thereof;

Z" is a p'-valent moiety derived from a moiety selected from the group consisting of a substituted or unsubstituted alkane, substituted or unsubstituted alkene, substituted or unsubstituted arene, substituted or unsubstituted heterocycle, a polymer chain, an organometallic species, and a combination thereof;

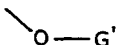
Z is selected from the group consisting of a halogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted alkylthio, substituted or unsubstituted alkoxycarbonyl, substituted or unsubstituted -COOR", carboxy, substituted or unsubstituted -CONR"₂, cyano, -P(=O)(OR")₂, -P(=O)R"₂;

E1 is a substituent functionality derived from a substituted or unsubstituted heterocycle attached via a nitrogen atom or is of the following formula:



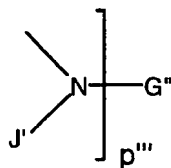
wherein G and J are independently selected from the group consisting of hydrogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkoxy, substituted or unsubstituted acyl, substituted or unsubstituted aroyl, substituted or unsubstituted aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkylsulfonyl, substituted or unsubstituted alkylsulfinyl, substituted or unsubstituted alkylphosphonyl, substituted or unsubstituted arylsulfonyl, substituted or unsubstituted arylsulfinyl, substituted or unsubstituted arylphosphonyl;

E2 is of the following formula:



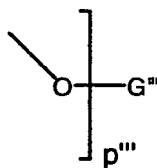
wherein G' is selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl;

5 E3 is of the following formula



wherein p''' is between 2 and 200, G'' is Z'' and J' is independently selected from the group consisting of hydrogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkoxy, substituted or unsubstituted acyl, substituted or unsubstituted aroyl, substituted or unsubstituted aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkylsulfonyl, substituted or unsubstituted alkylsulfinyl, substituted or unsubstituted alkylphosphonyl, substituted or unsubstituted arylsulfonyl, substituted or unsubstituted arylsulfinyl, substituted or unsubstituted arylphosphonyl or is joined to G'' so as to form a 5-8 membered ring; and

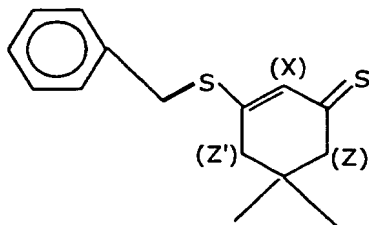
E4 is of the following formula



wherein p''' is between 2 and 200 and G''' is Z''

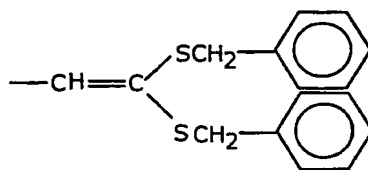
20 .2. The process of claim 1 wherein when p''' = 1 and D = D1 then E-C-X=C-Z' of said chain transfer agent forms a cyclic structure.

3. The process of claim 2 wherein said chain transfer agent is of the following formula:

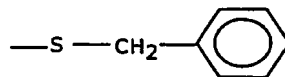


4. The process of claim 1 wherein said functionality derived from said substituted or unsubstituted heterocycle is selected from the group consisting of pyrrole, imidazole, lactam, cyclic imide, indole, carbazole, benzimidazole, benzotriazole, and isatin.

5. The process of claim 1 wherein said chain transfer agent comprises D1 having the following formula:

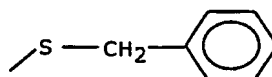


when E1 is of the following formula:

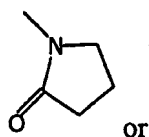


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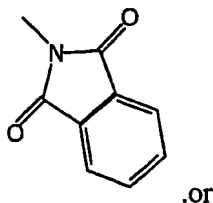
6. The process of claim 1 wherein said chain transfer agent comprises D2 having the following formula:



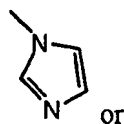
when E1 is of the following formula:



or

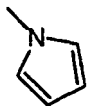


.or

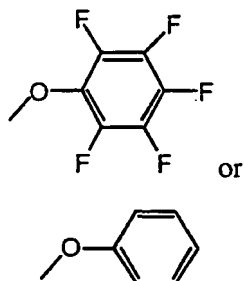


or

15

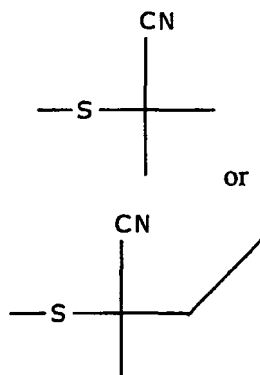


or E2 is of the following formula

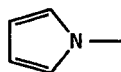


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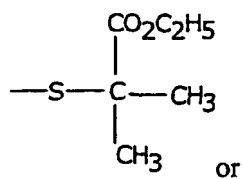
7. The process of claim 1 wherein said chain transfer agent comprises D2 having the following formula:



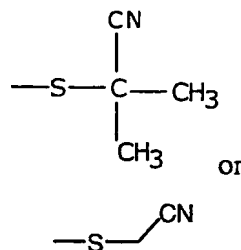
10 when E1 is of the following formula:



8. The process of claim 1 wherein said chain transfer agent comprises D2 having the following formula:



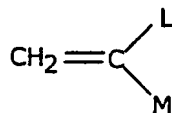
15



when E2 is of the following formula:



9. The process of claim 1 wherein said monomer mix comprises at least one vinyl monomer having the following formula:



where L is selected from the group consisting of hydrogen, halogen,
 10 and substituted or unsubstituted C₁-C₄ alkyl, said alkyl substituents being independently selected from the group consisting of hydroxy, alkoxy, OR", CO₂H, O₂CR", CO₂R" and a combination thereof;

where M is selected from the group consisting of hydrogen, R", CO₂H, CO₂R", COR", CN, CONH₂, CONHR", CONR"₂, O₂CR", OR", and halogen.

15 10. The process of claim 9 wherein said monomer mix further comprises maleic anhydride, N-alkylmaleimide, N-arylmaleimide, dialkyl fumarate, cyclopolymerizable monomer, a ring opening monomer, a macromonomer or a combination thereof.

11. The process of claim 1 wherein said monomer mix comprises
 20 maleic anhydride, N-alkylmaleimide, N-arylmaleimide, dialkyl fumarate, a cyclopolymerizable monomer, a ring-opening monomer or a combination thereof.

12. The process of claim 1 wherein said substituents are independently selected from the group that consists of alkyl, aryl, epoxy, hydroxy, alkoxy, oxo, acyl, acyloxy, carboxy, carboxylate, sulfonic acid, sulfonate, alkoxy- or aryloxy-
 25 carbonyl, isocyanato, cyano, silyl, halo, dialkylamino, and amido.

13. The process of claim 1 wherein said process is carried out in a polymerization medium containing said chain transfer agent, said monomer mix and said source of free radicals.

14. The process of claim 13 wherein said free radicals from said source of free radicals are introduced to said polymerization medium after the addition of said chain transfer agent and said monomer mix to said medium.

15. The process of claim 1 wherein said source of free radicals is selected from the group consisting of a thermal initiator, redox initiator, photo initiation system, and a combination thereof.

16. The process of claim 15 wherein said thermal initiator is selected from the group consisting of 2,2'-azobis(isobutyronitrile), 2,2'-azobis(2-cyano-2-butane), dimethyl 2,2'-azobisdimethylisobutyrate, 4,4'-azobis(4-cyanopentanoic acid), 1,1'-azobis(cyclohexanecarbonitrile), 2-(t-butylazo)-2-cyanopropane, 2,2'-azobis[2-methyl-N-(1,1-bis(hydroxymethyl)-2-hydroxyethyl] propionamide, 2,2'-azobis[2-methyl-N-hydroxyethyl]-propionamide, 2,2'-azobis(N,N'-dimethyleneisobutyramidine) dihydrochloride, 2,2'-azobis(2-amidinopropane) dihydrochloride, 2,2'-azobis(N,N'-dimethyleneisobutyramine), 2,2'-azobis(2-methyl-N-[1,1-bis(hydroxymethyl)-2-hydroxyethyl] propionamide), 2,2'-azobis(2-methyl-N-[1,1-bis(hydroxymethyl) ethyl] propionamide), 2,2'-azobis[2-methyl-N-(2-hydroxyethyl) propionamide], 2,2'-azobis(isobutyramide) dihydrate, 2,2'-azobis(2,2,4-trimethylpentane), 2,2'-azobis(2-methylpropane), t-butyl peroxyacetate, t-butyl peroxybenzoate, t-butyl peroxyoctoate, t-butyl peroxyneodecanoate, t-butylperoxy isobutyrate, t-amyl peroxy pivalate, t-butyl peroxy pivalate, di-isopropyl peroxydicarbonate, dicyclohexyl peroxydicarbonate, dicumyl peroxide, dibenzoyl peroxide, dilauroyl peroxide, potassium peroxydisulfate, ammonium peroxydisulfate, di-t-butyl hyponitrite, dicumyl hyponitrite and a combination thereof.

17. The process of claim 1 wherein said process is carried out at a polymerization temperature in the range of from — 20 °C to 200 °C.

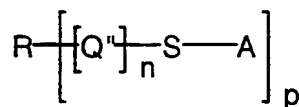
18. The process of claim 1 wherein said polymer has a polydispersity in the range of from 1.05 to 1.5.

19. The process of claim 1 wherein said polymer is a dispersed polymer or a solution polymer.

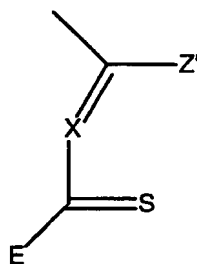
20. A polymer made in accordance with the process of claim 1.

21. A coating composition comprising a polymer made in accordance with the process of claim 1.

22. The process of claim 1 wherein said polymer is of the following formula:

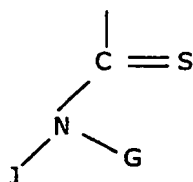


where n is a positive integer in the range of from 1 to 100,000 and wherein A is of the following formula:



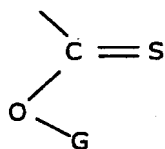
when D is D1 and E is Z';

A is of the following formula:



when D is D2 and E is E1; or

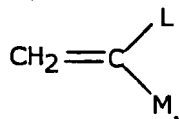
A is of the following formula:



when D is D2 and E is E2; and

10

and Q'' is a repeat unit derived from a monomer selected from the group consisting of maleic anhydride, N-alkylmaleimide, N-arylmaleimide, dialkyl fumarate, cyclopolymerizable monomer, a ring opening monomer, a macromonomer, a vinyl monomer of the following formula:



15

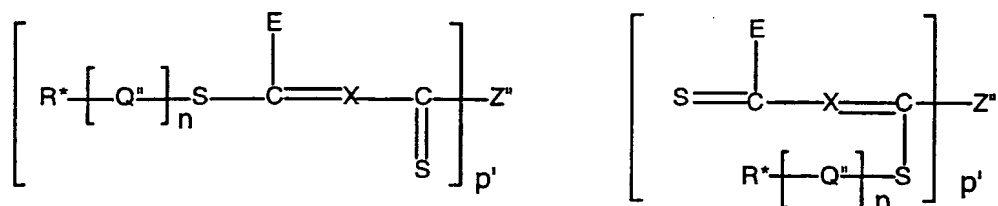
and a combination thereof;

wherein L is selected from the group consisting of hydrogen, halogen, and substituted or unsubstituted C₁-C₄ alkyl, said alkyl substituents being independently selected from the group consisting of hydroxy, alkoxy, OR'', CO₂H, O₂CR'', CO₂R'' and a combination thereof; and

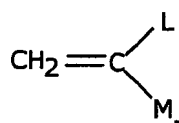
20

wherein M is selected from the group consisting of hydrogen, R", CO₂H, CO₂R", COR", CN, CONH₂, CONHR", CONR"₂, O₂CR", OR", and halogen.

23. The process of claim 1 wherein said polymer is a mixture of
5 isomers of the following formula:



- where n is a positive integer in the range of from 1 to 100,000, D is D3, E is Z;
and Q'' is a repeat unit derived from a monomer selected from the group
consisting of maleic anhydride, N-alkylmaleimide, N-arylmaleimide, dialkyl
10 fumarate, cyclopolymerizable monomer, a ring opening monomer, a
macromonomer, a vinyl monomer of the following formula:

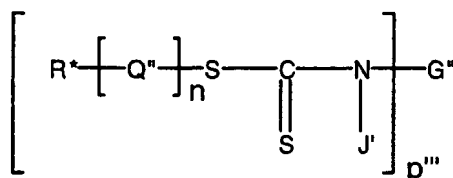


and a combination thereof;

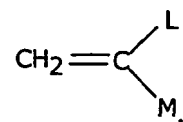
- 15 wherein L is selected from the group consisting of hydrogen, halogen,
and substituted or unsubstituted C₁-C₄ alkyl, said alkyl substituents being
independently selected from the group consisting of hydroxy, alkoxy, OR", CO₂H,
O₂CR", CO₂R" and a combination thereof; and

- wherein M is selected from the group consisting of hydrogen, R",
20 CO₂H, CO₂R", COR", CN, CONH₂, CONHR", CONR"₂, O₂CR", OR", and
halogen.

24. The process of claim 1 wherein said polymer is of the following
formula:



- where n is a positive integer in the range of from 1 to 100,000, D is D4, E is E3;
 and Q'' is a repeat unit derived from a monomer selected from the group
 consisting of maleic anhydride, N-alkylmaleimide, N-arylmaleimide, dialkyl
 fumarate, cyclopolymerizable monomer, a ring opening monomer, a
 5 macromonomer, a vinyl monomer of the following formula:

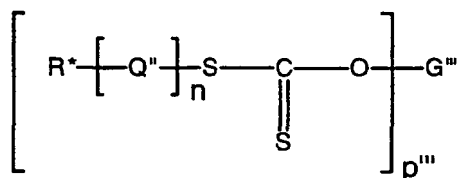


and a combination thereof;

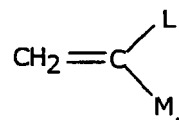
- wherein L is selected from the group consisting of hydrogen, halogen,
 10 and substituted or unsubstituted C₁-C₄ alkyl, said alkyl substituents being
 independently selected from the group consisting of hydroxy, alkoxy, OR'', CO₂H,
 O₂CR'', CO₂R'' and a combination thereof; and

- wherein M is selected from the group consisting of hydrogen, R'',
 CO₂H, CO₂R'', COR'', CN, CONH₂, CONHR'', CONR''₂, O₂CR'', OR'', and
 15 halogen.

25. The process of claim 1 wherein said polymer is of the following
 formula:



- where n is a positive integer in the range of from 1 to 100,000, D is D4, E is E4;
 20 and Q'' is a repeat unit derived from a monomer selected from the group
 consisting of maleic anhydride, N-alkylmaleimide, N-arylmaleimide, dialkyl
 fumarate, cyclopolymerizable monomer, a ring opening monomer, a
 macromonomer, a vinyl monomer of the following formula:



- 25 and a combination thereof;

wherein L is selected from the group consisting of hydrogen, halogen, and substituted or unsubstituted C₁-C₄ alkyl, said alkyl substituents being independently selected from the group consisting of hydroxy, alkoxy, OR", CO₂H, O₂CR", CO₂R" and a combination thereof; and

5 wherein M is selected from the group consisting of hydrogen, R", CO₂H, CO₂R", COR", CN, CONH₂, CONHR", CONR"₂, O₂CR", OR", and halogen.

26. The process of claim 1 wherein said monomer mix comprises vinyl acetate, vinyl butyrate, vinyl benzoate, vinyl chloride, vinyl bromide, vinyl
10 fluoride, N-vinylpyrrolidone, N-vinylcarbazole or a combination thereof.

27. The process of claims 1 and 26 wherein D=D₂, E=E₁ or E₂ in said CTA and wherein G, J, and G' are independently selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted alkene, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl.

15 28. The process of claim 27 wherein when E=E₁, G-N=J form part of a non-aromatic cyclic group.

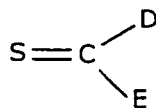
29. The process of Claim 1 wherein said monomer mix comprises a methacrylate, acrylate and styrenic monomers and wherein D=D₂, E=E₁ and G-N-J forms part of aromatic cyclic group or a non-aromatic cyclic group with
20 substituent conjugated to N.

30. The process of claim 29 where said substituent E₁ is substituted or unsubstituted pyrrole, substituted or unsubstituted imidazole, substituted or unsubstituted 2-lactam, substituted or unsubstituted imide.

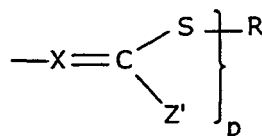
31. The process of claim 1 and 25 wherein said monomer mix
25 comprises a methacrylate, acrylate, styrenic monomers and a combination thereof, wherein D=D₂, E=E₂ in said CTA and wherein G' is aryl.

32. The process of claim 31 wherein said aryl is OC₆H₅ or C₆F₆.

33. The process for producing a polymer, said process comprising:
charging a polymerization medium in a reactor with a chain transfer
30 agent; introducing a source of free radicals and a monomer mix into said medium to polymerize said monomer mix into said polymer, said chain transfer agent having a transfer constant in the range of from 0.1 to 5000 and having the following formula:

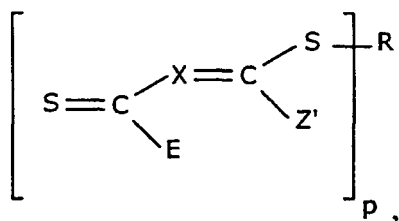


wherein when D is D1 of the following formula:

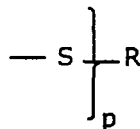


then p is in the range of from 1 to 200, E is Z' and said transfer agent is of the

5 following formula:

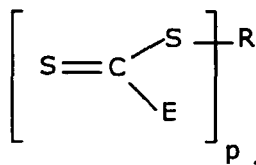


wherein when D is D2 of the following formula:

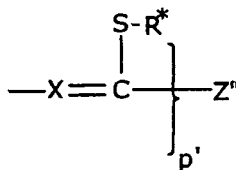


then p is in the range of from 1 to 200, E is E1 or E2 and said transfer agent is of

10 the following formula:

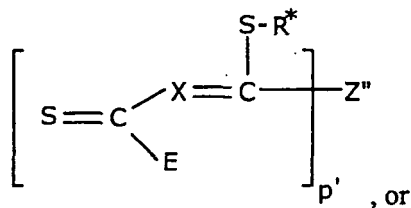


wherein when D is D3 of the following formula:

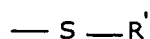


then p' is in the range of from 2 to 200, E is Z, E1 or E2 and said transfer agent is

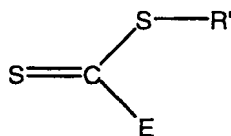
15 of the following formula:



wherein when D is D4 of the following formula:



then E is E3 or E4 and said transfer agent is of the following formula:



5 where in all of the above:

R is a p-valent moiety derived from a moiety selected from the group consisting of substituted or unsubstituted alkane, substituted or unsubstituted alkene, substituted or unsubstituted arene, unsaturated or aromatic carbocyclic ring, unsaturated or saturated heterocyclic ring, an organometallic species, and a polymer chain, R• being a free radical leaving group resulting from R that initiates free radical polymerization;

15 R* and R' are monovalent moieties independently selected from the group consisting of a substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, unsaturated or aromatic carbocyclic ring, unsaturated or saturated heterocyclic ring, substituted or unsubstituted alkylthio, substituted or unsubstituted alkoxy, substituted or unsubstituted dialkylamino, an organometallic species, and a polymer chain, R*• being a free radical leaving group resulting from R* that initiates free radical polymerization;

20 X is selected from the group consisting of a substituted or unsubstituted methine, nitrogen, and a conjugating group;

Z' is selected from the group consisting of E1, E2, halogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted alkylthio, substituted or unsubstituted alkoxycarbonyl, substituted or unsubstituted -COOR", carboxy, substituted or unsubstituted -CONR"2, cyano, -P(=O)(OR")2, -P(=O)R"2;

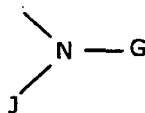
R" is selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl,

substituted or unsubstituted heterocyclyl, substituted or unsubstituted aralkyl, substituted or unsubstituted alkaryl, and a combination thereof;

5 Z'' is a p' -valent moiety derived from a moiety selected from the group consisting of a substituted or unsubstituted alkane, substituted or unsubstituted alkene, substituted or unsubstituted arene, substituted or unsubstituted heterocycle, a polymer chain, an organometallic species, and a combination thereof;

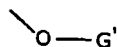
Z is selected from the group consisting of a halogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or
10 unsubstituted alkylthio, substituted or unsubstituted alkoxy carbonyl, substituted or unsubstituted $-COOR''$, carboxy, substituted or unsubstituted $-CONR''_2$, cyano, $-P(=O)(OR'')_2$, $-P(=O)R''_2$;

$E1$ is a substituent functionality derived from a substituted or unsubstituted heterocycle attached via a nitrogen atom, or is of the following
15 formula:



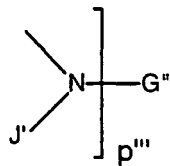
wherein G and J are independently selected from the group consisting of hydrogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkoxy, substituted or unsubstituted acyl,
20 substituted or unsubstituted aroyl, substituted or unsubstituted aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkylsulfonyl, substituted or unsubstituted alkylsulfinyl, substituted or unsubstituted alkylphosphonyl, substituted or unsubstituted arylsulfonyl, substituted or unsubstituted arylsulfinyl, substituted or unsubstituted
25 arylphosphonyl;

$E2$ is of the following formula:



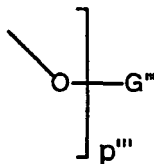
wherein G' is selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or
30 unsubstituted aryl;

$E3$ is of the following formula



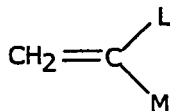
- wherein p''' is between 2 and 200, G'' is Z'' and J' is independently selected from the group consisting of hydrogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkoxy, substituted or unsubstituted acyl, substituted or unsubstituted aroyl, substituted or unsubstituted aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkylsulfonyl, substituted or unsubstituted alkylsulfinyl, substituted or unsubstituted alkylphosphonyl, substituted or unsubstituted arylsulfonyl, substituted or unsubstituted arylsulfinyl, substituted or unsubstituted arylphosphonyl or is joined to G'' so as to form a 5-8 membered ring; and

E4 is of the following formula



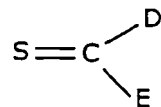
wherein p''' is between 2 and 200 and G''' is Z'' .

- 15 said monomer mix comprising one or more monomers selected from the group consisting of maleic anhydride, N-alkylmaleimide, N-arylmaleimide, dialkyl fumarate, cyclopolymerizable monomer, and vinyl monomer having the formula:

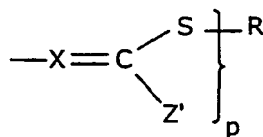


- 20 where L is selected from the group consisting of hydrogen, halogen, and substituted or unsubstituted C_1 - C_4 alkyl, said alkyl substituents being independently selected from the group consisting of hydroxy, alkoxy, OR'' , CO_2H , O_2CR'' , CO_2R'' and a combination thereof;
- where M is selected from the group consisting of hydrogen, R'' , CO_2H , CO_2R'' , COR'' , CN , $CONH_2$, $CONHR''$, $CONR''_2$, O_2CR'' , OR'' , and halogen.
- 25

34. A chain transfer agent having a transfer constant in the range of from 0.1 to 5000, said chain transfer agent having the following formula:

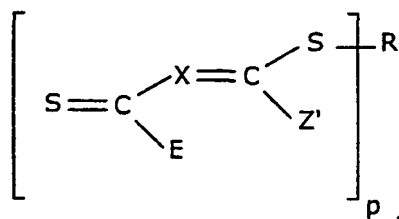


wherein when D is D1 of the following formula:

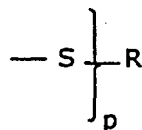


5

then p is in the range of from 1 to 200, E is Z' and said transfer agent is of the following formula:

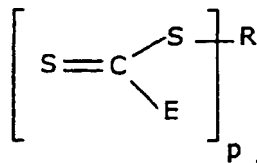


wherein when D is D2 of the following formula:

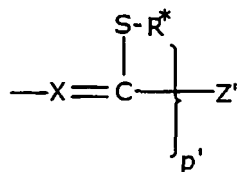


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then p is in the range of from 1 to 200, E is E1 or E2 and said transfer agent is of the following formula:

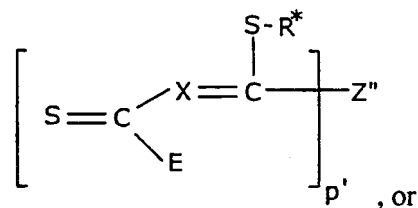


wherein when D is D3 of the following formula:

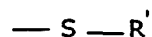


15

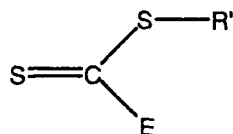
then p' is in the range of from 2 to 200, E is Z, E1 or E2 and said transfer agent is of the following formula:



wherein when D is D4 of the following formula:



then E is E3 or E4 and said transfer agent is of the following formula:



5

where in all of the above:

R is a p-valent moiety derived from a moiety selected from the group consisting of substituted or unsubstituted alkane, substituted or unsubstituted alkene, substituted or unsubstituted arene, unsaturated or aromatic carbocyclic ring, unsaturated or saturated heterocyclic ring, an organometallic species, and a polymer chain, R• being a free radical leaving group resulting from R that initiates free radical polymerization;

R* and R' are monovalent moieties independently selected from the group consisting of a substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, unsaturated or aromatic carbocyclic ring, unsaturated or saturated heterocyclic ring, substituted or unsubstituted alkylthio, substituted or unsubstituted alkoxy, substituted or unsubstituted dialkylamino, an organometallic species, and a polymer chain, R*• being a free radical leaving group resulting from R* that initiates free radical polymerization;

X is selected from the group consisting of a substituted or unsubstituted methine, nitrogen, and a conjugating group;

Z' is selected from the group consisting of E1, E2, halogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted alkylthio, substituted or unsubstituted alkoxycarbonyl, substituted or

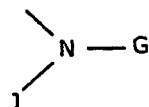
unsubstituted -COOR", carboxy, substituted or unsubstituted -CONR"₂, cyano, -P(=O)(OR")₂, -P(=O)R"₂;

R" is selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted aralkyl, substituted or unsubstituted alkaryl, and a combination thereof;

Z" is a p'-valent moiety derived from a moiety selected from the group consisting of a substituted or unsubstituted alkane, substituted or unsubstituted alkene, substituted or unsubstituted arene, substituted or unsubstituted heterocycle, a polymer chain, an organometallic species, and a combination thereof;

Z is selected from the group consisting of a halogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl, substituted or unsubstituted heterocyclyl, substituted or unsubstituted alkylthio, substituted or unsubstituted alkoxy, substituted or unsubstituted -COOR", carboxy, substituted or unsubstituted -CONR"₂, cyano, -P(=O)(OR")₂, -P(=O)R"₂;

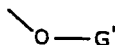
E1 is a substituent functionality derived from a substituted or unsubstituted heterocycle, attached via a nitrogen atom, or is of the following formula:



20

wherein G and J are independently selected from the group consisting of hydrogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkoxy, substituted or unsubstituted acyl, substituted or unsubstituted aroyl, substituted or unsubstituted aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkylsulfonyl, substituted or unsubstituted alkylsulfinyl, substituted or unsubstituted alkylphosphonyl, substituted or unsubstituted arylsulfonyl, substituted or unsubstituted arylsulfinyl, substituted or unsubstituted arylphosphonyl;

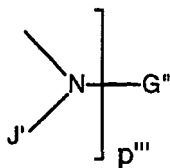
E2 is of the following formula:



30

wherein G' is selected from the group consisting of substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted aryl;

E3 is of the following formula

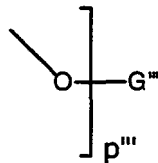


5

wherein p''' is between 2 and 200, G'' is Z'' and J' is independently selected from the group consisting of hydrogen, substituted or unsubstituted alkyl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkoxy, substituted or unsubstituted acyl, substituted or unsubstituted aroyl, substituted or unsubstituted aryl, substituted or unsubstituted heteroaryl, substituted or unsubstituted alkenyl, substituted or unsubstituted alkylsulfonyl, substituted or unsubstituted alkylsulfinyl, substituted or unsubstituted alkylphosphonyl, substituted or unsubstituted arylsulfonyl, substituted or unsubstituted arylsulfinyl, substituted or unsubstituted arylphosphonyl or is joined to G'' so as to form a 5-8 membered ring; and

15

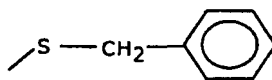
E4 is of the following formula



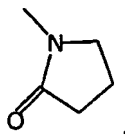
wherein p''' is between 2 and 200 and G''' is Z''.

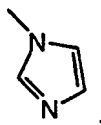
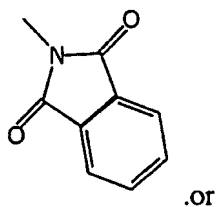
35. The chain transfer agent of claim 34 where D2 is of the following formula:

20

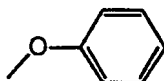
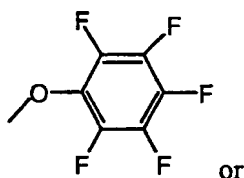


when E is E1 or E2, wherein E1 is of the following formula:



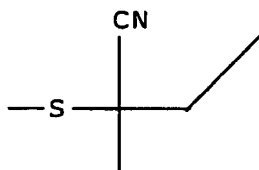
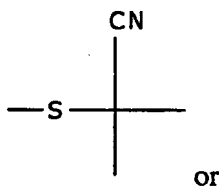


and E2 is of the following formula:

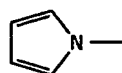


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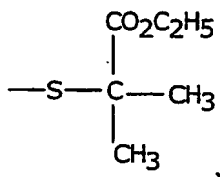
36. The chain transfer agent of claim 34 where D2 is of the following formula:

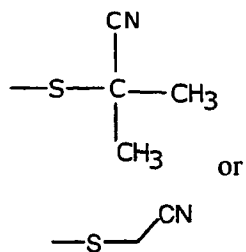


10 when E1 is of the following formula:

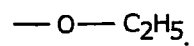


37. The chain transfer agent of claim 34 where D2 is of the following formula:





when E2 is of the following formula:



- 5 38. The process of claim 1 wherein said polymer a block or gradient copolymer produced by sequentially adding monomers.